INSTALLATION STANDARDS

SINGLE FAMILY DWELLINGS

ALL OF THE FOLLOWING APPLICABLE MEASURES MUST BE INSTALLED WITH THE EXCEPTIONS BELOW.

I. INSPECT HEATING/COOLING EQUIPMENT AND REPAIR AS NECESSARY (to include duct diagnostics and sealing).

II. SEAL MAJOR AIR LEAKS AND BYPASSES.

III. INSULATE SIDEWALLS.

IV. INSULATE AND VENT ATTIC.

V. INSULATE DUCTS/HEATING PIPES.

VI. INSULATE DOMESTIC WATER HEATER.

EXCEPTIONS

1. The local administrator shall be exempt from performing a particular measure if there are pre-existing, health, safety, or technical reasons, which must be documented in the client's file, why a particular measure cannot be performed. Example: Serious moisture problems exist in the home, which cannot be corrected.

2. If a client/owner/authorized agent refuses to allow a required weatherization measure or procedure to be performed or completed, the local administrator shall determine if safe, effective, and meaningful weatherization services can still be provided. If not, the unit shall not be weatherized. In all cases, client refusal and the date of client refusal must be documented in the client file.

NOTE:

- Local Administrators shall not avoid completing the necessary range of required weatherization measures by "documenting away" a measure. This means that the Local Administrator shall never seek or gain a signed release from the client/owner/authorized agent to deliberately avoid a weatherization measure or procedure.

- Reasons for exempting walls must be documented, but in no case may any wall or cavity be only partially insulated.

- If the heating equipment is unsafe and needs to be replaced or major repairs are needed and there are insufficient resources available, no weatherization work may be performed on the house.

*** NOTE *** the heating/cooling system safety inspection measures included do not violate State Codes, nor do they require any State license or certification. However, local codes, interpretation of local codes, and enforcement of local codes varies. Consequently, local code enforcement officials should be contacted, and familiarized with the measures to be performed. If any of these measures appear to violate local codes, or require any licensing or certification locally, DHCD must be notified. DHCD will then communicate with local code enforcement officials and attempt to resolve any problems. If there is no resolution, measures in violation of local codes and Historical Restrictions will not be required to be performed. Building permits must be secured, where required (this is a material cost).

Refer to Reference Material Appendix for all required reference materials.

BLOWER DOOR STANDARDS

Attached to the back of the Installation Standards are procedures and closure targets for using the blower door to address air leakage. A pre-weatherization and a post-weatherization blower door test must be performed on each house. The test readings must be documented on the job report.

Prior approval from DHCD will be necessary for a job to be accepted without a blower door pre-test and post-test for any reason.

Air leakage must be diagnosed by using the blower door, or if the exception applies, then a visual diagnosis must be used. Once the pre-test has been taken, then the closure target must be determined.

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THE POST-TEST SHOULD FALL AT OR BELOW THE CLOSURE TARGET. If a submitted job does not meet the closure target, explanation should be provided on the job report, all priority measures must be performed; the job will be accepted, reimbursed, and targeted for monitoring. If the blower door reading falls below the MVR, then a house specific MVR must be done.

Measures, which are most apt to affect the blower door reading, are: Sealing Major Air Leaks/Bypasses, and Sidewall Insulation

I. INSPECT HEATING/COOLING SYSTEM AND REPAIR AS NECESSARY.

A. Inspect heating system for safety problems.

A safety inspection involves both a visual inspection and test procedures designed to verify that any operational heating unit is burning fuel and exhausting flue gases in a safe manner. Refer to the Virginia Heating Systems Training Manual for inspection procedures. Refer also to Program Guidance 6265.10, dated March 24, 1992, from the DOE Philadelphia Support Office, which provides DOE's interim space heater policy.

All operational combustion appliances shall be included in the safety inspection. These include oil and gas furnaces, wood and coal stoves,boilers, oil and gas space heaters**,** wood and gas cook stoves, gas dryers and gas and oil water heaters. EXCEPTION: Wood and lump coal units where no fuel is available, or during the hot season, need only be visually checked for the following when applicable: heat exchanger leakage and corrosion, unsafe or improper wiring, venting, and clearances from combustibles.

When problems need to be corrected before proceeding with other work, the standards will explicitly state that requirement. Where remedial work is not required, only written documentation must be provided.

1. Inspect the fuel supply.

a. PROPANE, NATURAL GAS: If gas leakage is detected, verify with bubble test, inform the occupant and leave the dwelling. Shut off the supply valve and have the occupant notify the fuel supplier. The problem must be corrected before **the heating system** inspection is continued, and before any other weatherization is performed.

b. FUEL OIL**:** Any fuel leak should be corrected prior to weatherization work.being performed. Non-weatherization resources may be required to correct the problem depending on the circumstances
In some fuel oil systems, oil can build up in the combustion chamber due to constant pushing of the reset button. The combustion chamber must be checked prior to firing the heating unit to determine whether a build-up of fuel has occurred.

2. Inspect the power supply.

The inspector must determine whether the condition of the electrical power supply is adequate and appropriate for the existing or any replacement heating system. Determine that wiring is safe and properly fused. Check to see that wiring is not in contact with hot surfaces of the heating unit.

The heating unit may be on a separate electrical circuit. An extension cord should not be used to supply power to the unit. The condition of the electrical power supply

must be documented.

3. Inspect Combustion Air Systems

a. Adequate air shall be available to the heating system for combustion**. Refer to NFPA code unconfined and confined section for proper calculation.**

b. Draft shall be measured and determined to be acceptable. Refer to the Virginia Heating Systems Training Manual for probe placement and acceptable readings (gas, page 8-9; oil, page 33; space heaters, pages 26 and 38). A draft reading of .01 WC (or PMI) is acceptable for a manufactured home**.** This does not preclude the need to conduct a thorough examination of the venting system.

Draft must be measured under "winter" operating conditions (doors and windows closed), and under the following conditions:

. **Under worst case Combustion Appliance Zone (CAZ) conditions**.

Draft must be within acceptable range under worst case CAZ conditions in order to perform weatherization measures.

When a combustion appliance is present (to include woodstoves and fireplaces), the area where the appliance is located must be closed off and a pressure test taken of this zone with reference to the outside. If a forced air distribution system is present, the test must be taken with the air handler on. The house must also be tested under "worst case" conditions (all exhaust devices on). If the pressure in this zone is negative five (-5) pascals or greater**,** there is potential for the appliance to backdraft, and steps must be taken to relieve the negative pressure in this zone. If a sealed combustion furnace is present then a –10 pascals or greater may cause back drafting. Mobile home furnace or monitor heaters are two examples of sealed combustion units.

The draft test and pressure test must be repeated after weatherization work is completed. If the reading does not fall within the acceptable range, the local administrator bears the responsibility of having the problem corrected prior to submitting the job for completion.

c. Test for the presence of carbon monoxide (CO) in an "air free" sample of the flue gases (see Heating Systems Training Manual). There must be no more than 100 parts per million (ppm) in the flue gases. Excessive CO levels in the flue gases must be corrected before any weatherization work can be performed.

Test for the presence of carbon monoxide in the living area. There must be no more than 9-ppm carbon monoxide in the living area. The presence of CO in the living area is a life-threatening emergency situation. If possible, determine the source of the CO. The client must be informed of the risk and advised not to use the appliance until the problem is corrected. This problem must be corrected before any weatherization can be performed.

The test for the presence of carbon monoxide in the flue gases and in the living area must be repeated after weatherization work is completed. If acceptable levels are exceeded, the local administrator bears the responsibility of having the problem corrected before submitting the job for completion.

Carbon monoxide detectors must be installed in **all** dwellings**.** CO detectors must be either "plug-in" or hardwired, and location within the dwelling should be according to manufacturers' recommendation. These detectors must be UL listed and have a battery back up.

d. Inspect the heat exchanger for cracks or holes. The inspector must judge whether the condition of the heat exchanger is hazardous enough to prohibit further weatherization work on a house. The condition of the heat exchanger must be documented.

In the case of wood and coal stoves, the stove itself is a heat exchanger. Check for cracks and holes that may allow sparks, combustion gases, or smoke to enter the living area.

4. Examine the entire vent system, including the chimney, to determine whether any sections of the vent are disconnected, loose, leaky, extremely corroded, or missing. The inspector must judge whether the vent system is hazardous enough to prohibit further weatherization work on a house. The condition of the vent system must be documented.

Vent connectors should be properly connected. Single-wall pipe must not pass through combustible materials, and should not be used outside or in unconditioned areas. Vent connectors exhausted into a lined or an unlined chimney should be checked for proper draft, obstructions, proper maintenance, and the exhausting of flue gases into the living area. Vent connectors should have at least 1/4" rise for every foot of horizontal run, and should have the least number of turns needed to reach the main vent.

When two appliances on the same floor share a common main vent, the appliance with the lower BTU input must be vented above the higher BTU appliance. The size of the common main vent must be large enough to carry the BTU input of both appliances.

Vents passing through the roof should extend three feet above the roof surface and at least two feet higher than any part of the dwelling within a horizontal distance of 10 feet. Chimneys must be lined according to code requirements. **Wood,Coal, and Gas masonry chimneys must be lined**

5. Clearance from Combustibles

The inspector must judge whether a heating unit has sufficient clearance from combustible surfaces including walls, ceilings, floors, and framing materials. The inspector should also check for stacks of newspapers, rags, oil, gasoline cans, and other combustibles, which may pose a fire hazard. Any problems, which are deemed hazardous, should be corrected before weatherization work is performed.
Smoke detectors must be installed in all dwellings. Smoke detectors must be either battery-operated or hardwired, and location within the dwelling should be according to manufacturers' recommendation. If there is an existing smoke detector, it should be checked to ensure that it is working properly. If it is not, it must be replaced, or a new battery may be installed and the client must be shown how to test the detector and replace the battery. Smoke detectors must be UL listed.

6. Safety Controls

The inspector must judge whether the condition of the safety controls poses a safety hazard. Do a visual inspection only on these controls. Refer to a private contractor if in doubt due to possible risk involved in manual activation of some controls. Any problems, which are deemed hazardous, should be documented and corrected before weatherization work is performed.

7. Unvented Space Heaters

Refer to Program Guidance WPN-08-4 Space Heater Policy , dated March 23,2008, from the DOE NETL, which provides DOE's interim space heater policy.

If an unvented space heater (for example, a portable kerosene heater) is the only source of heat, do not perform any weatherization work on the house. An information sheet should be provided which explains the hazards of unvented space heater use.

If an unvented space heater is used as a secondary heat source, the house may be weatherized. However, the client must be provided an information sheet, which explains the hazards of unvented space heater use.

8. Replacing Heating Systems

Heating systems may be replaced using the criteria below (refer also to DOE Program Guidance 6265.10, dated March 24, 1992, DOE's interim space heater policy). Consideration should be given to households with an occupant on oxygen and to whether the client can maintain the operating cost of the replacement unit. A load calculation must be used to determine correct sizing for the replacement unit, taking into consideration weatherization measures performed on the home. This calculation must be maintained in the client file. Care must also be taken to ensure that the flue/vent is properly sized for the new system.

1. Where any **unvented space heater is the only source of heat.**

2. Where no operable or safe heating system exists

3. Where an unacceptable level of carbon monoxide is being created by the heating system, which cannot be repaired.

B. Improve the efficiency of forced air heating distribution systems.

1. Seal plenum, duct and register leaks with mastic. All supply and return registers must have a maximum pressure pan reading of 1 pascal. Provide pressure relief as determined necessary to address safety, comfort and efficiency.

2. Provide six month's supply of furnace filters or **2** washable filters.

3. When there is an existing forced air distribution system, filter(s) must be installed (if missing) or replaced, and a (6) month’s supply of

appropriately sized filters for each filter location must be provided to the client. Weatherization personnel must teach the client how to change the filter. If a permanent filter is present, the client must be taught to remove, clean and replace the filter. **Return grills may be replaced with filter grills for better client accessibility.**

4. Clean out squirrel cage blower and obstructed ducts.

5. Check for appropriately sized duct. Correct if resources exist.

6. Conduct heat rise test on all forced air systems.

7. Clean accessible duct as much as possible before duct sealing.

C. Improve the efficiency of window air conditioners.

1. Clean or replace air conditioner filter. The client must be taught how to clean filter by Weatherization personnel.

2. Clean air conditioner cooling fins.

3. Check for proper installation.
If a window air conditioner is left in year round it must be air sealed with permanent blocking and a cover must be installed or left with the client.

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II.

SEAL MAJOR AIR LEAKS AND BYPASSES INCLUDING INSULATING SIDEWALLS.

Look for indoor air quality problems (e.g. signs of condensation on the inside of the dwelling), which should be addressed prior to performing air sealing measures. These problems should be addressed at the source of the problem.

Use the blower door to diagnose air leakage.

A. Prevent convective and conductive heat loss, which results from the free movement of air between the attic and basement/crawlspace. In addition to the following requirements, ventilated attics must have a post-test zonal pressure of at least 45 Pascals with reference to the house. (Note: If an attic is unventilated, and neither insulation nor ventilation will be added, do not ventilate for the sole purpose of obtaining a zonal pressure.) A visual inspection must be performed in addition to attaining the zonal pressure required above.

1. Seal bypasses in stud cavities and joist cavities to stop free air movement.

2. Seal partition walls at top and bottom to stop free air movement.

3. Seal chimney, plumbing, and electrical chases at top and bottom to stop free air movement.

4. Seal openings at the sill plate/band joist to stop free air movement.

B. Prevent convective heat loss which results from large direct openings between the interior and exterior of the house.

1. Replace missing or broken glass, missing windows, missing doors.

2. Seal holes in ceilings, which communicate directly with the attic.

3. Seal holes in walls and floors, which communicate directly with the exterior of the house, the basement/crawlspace, or with the kneewall attic.

4. Seal unused flue openings and fireplaces

5. Construct a removable door for fireplaces, which do not have an operable damper, and are used occasionally.
6. Check to insure dryer vents are **non-combustible**, clean and have no loops in vent hose**.**

7. Seal or damper dryer vents, kitchen exhaust fans, window air conditioners, utility penetrations etc. to the outside of the building shell.

8. All kitchen and bath fans currently venting into the attic must be vented to the outdoors through roof fittings. Fans without operating backdraft dampers must be repaired, equipped with back draft dampers, or the fan must be replaced. Check new fans for proper damper operation.

9. All exhaust fans must be repaired or replaced if not working, if replaced it must be vented to the outdoors.

10. If there is a working re-circulation fan it may be replaced with one that vents outdoors.

11. All gas ranges must have an exhaust fan vented to the outdoors.

12. Any kitchen range vents that are repaired or replaced must be vented with rigid pipe.

C. A continuous ground cover with a minimum thickness of 6 mil. Will be installed in enclosed crawlspaces to prevent the diffusion of soil moisture into the building materials.

INSULATE SIDEWALLS

Reduce convective heat loss through small cracks by blowing sidewalls with dense-pack cellulose. Reduce conductive heat loss by increasing the R-value of exterior walls. (Reference Technical Manual, Section 5.)

Building permits must be secured, where required (this is a material cost).

A. Fill sidewalls to capacity using the dense-pack method to a minimum density of 3.5 pounds per cubic foot. Anything less than a dense pack should be documented, ex. Weak walls that are packed as tight as possible.

B. Only cellulose insulation shall be used, except that blown fiberglass may be used in a stud cavity adjacent to a chimney or other combustible.

C. All walls between heated and unheated areas, and all walls between heated areas and the exterior of the house must be insulated.

D. Sidewall insulation must be installed either by removing exterior siding or by drilling holes from the interior of the house.

E. Where incomplete sidewall insulation exists, insulation will be added to provide complete sidewall coverage. The local agency must insure that all exterior walls have complete sidewall coverage.

F. Reasons for exempting walls must be documented, but in no case may any wall or cavity be only partially insulated.

G. The following exceptions will be allowed, but must be documented, and the burden of proof will lie with the Local Administrator.

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1. Existing sidewall insulation

2. No wall cavity

3. Knob-and-tube wiring present in wall cavity, and testing of the wiring indicate unsafe wiring exists and there are insufficient funds available to replace the wiring.

4. Interior and/or exterior wall too weak to withstand pressure of sidewall insulation

5. Client refusal - documented by signed agreement.

6. Existing moisture problems, which cannot be remedied.

III. INSULATE AND VENT ATTIC

A. Insulation will be installed in attic areas located directly above heated areas as follows:

All attics shall be insulated to R-38 and vented to standards, (Attachment I).
Reasons for not being able to insulate to R-38 must be documented in the client file**.**

B. A three **(3)** inch minimum clearance from insulation or other combustible materials must be maintained with a permanent blocking material around **all** chimneys and flues. A three (3) inch minimum clearance from cellulose and paper backed fiberglass insulation must be maintained with a permanent blocking material around recessed light fixtures, transformers, furnaces, and any other heat producing device. Neither insulation nor blocking material may cover these devices. Chimney chases must be sealed with metal flashing and high temperature caulk.

C. Permanent blocking material will be installed around trap doors or scuttles so as to restrain insulation from falling through these openings.

The attic side of trap doors, scuttles, and **pull down staircases** must be insulated with a minimum of R-38 fiberglass batt or some other suitable insulation.

Weather-strip the trap door or attic scuttle.

D. Weather strip kneewall access doors.

Attic side of kneewalls must be air sealed and insulated to minimum R-13.

E. Free circulation of air through soffit vents must be ensured either through the use of blocking materials or by removal of insulation from around the vents.

F. Any pockets or voids in the insulation must be filled so that insulation is of a uniform R-value.

G. Venting of attic area must be consistent with established attic ventilation standards (Attachment 1). Louvered vents will be assumed to have Net Free Area (NFA) of ventilation equal to one-half (1/2) the area of the vent opening, unless otherwise indicated and documented (such as a stamp on the vent package).

Non-louvered vents will be assumed to have NFA of ventilation equal to the area of the vent

opening, unless otherwise indicated and documented.

Turbine vents with a 12" throat diameter will be assumed to have NFA equal to 364 square inches. Turbine vents with a 14" throat diameter will be assumed to have NFA equal to 432 square inches.

H. Vents must be louvered and/or sealed to prevent rainwater from entering the vent opening.

I. If wiring in the attic area appears unsafe due to cracked, blistered, or deteriorated wiring insulation, or if circuits otherwise indicate overloading, the attic shall not be insulated out of consideration for fire hazards until these situations are corrected.

Such exceptions must be documented and the burden of evidence will lie with the Local Administrator. Attics containing knob and tube wiring shall be rewired and inspected by a licensed electrician prior to insulating.

Insure all electrical junction boxes are covered and marked prior to insulation.

J. Cellulose promotes recycling and, when applied correctly, provides a better sealing effect in the attic area. Blown fiberglass may be used to insulate attics only with prior approval from DHCD.

V. INSULATE DUCTS/HEATING PIPES

A. Only ducts or pipes located in unheated areas will be insulated. Return and supply ducts/pipes must both be insulated.

Where ducts or heating pipes are located in unheated areas with plumbing, provisions must be made to hinder the freezing of plumbing pipes prior to insulation.

If a basement has a zonal pressure no higher than 10 Pascals with reference to the house, then the basement may be considered "inside", and duct insulation is not required.

B. Ducts will be insulated with mineral fiber insulation, **bubble wrap insulation or two-part foam** with an R-value of (6) or greater.

Hydronic heating pipes will be insulated with either rigidly closed cell vinyl foam or mineral fiber insulation manufactured for the purpose of insulating pipes. When using mineral fiber insulation, a vapor impermeable wrapping must be applied on the outside of the insulation.

C. Ducts and heating pipes must not be insulated within three (3) feet of the furnace exhaust stack.

D. Insulation joints will be tightly butted or overlapped so as to completely surround ducts and pipes. An exception to this will be the case of ducts attached to joists, floors or some other obstacle, which prevents wrapping. In this case, insulation will cover the part of the duct exposed to the winter cold side and will be attached to the barrier if possible. Insulation joints will be taped completely with aluminum tape or some other appropriate permanent fastener.

E. Where insulation is applied on rectangular ducts, insulation installed on corners will not be compressed more than 50% of its normal thickness.

F. When ducts and pipes are not completely accessible, all accessible ducts and pipes must be insulated.

. INSULATE DOMESTIC WATER HEATER

A. Water heaters will be insulated with mineral fiber insulation with a protective backing attached or **bubble wrap** insulation with an R-value of five (5) or better will be used.

Insulation will be applied with the protective backing toward the outside.

B. ELECTRIC WATER HEATERS: Insulation will be applied to the top and sides of the water heater. The overlapped ends of the protective backing should be sealed, and banded in order to provide an adequate seal.
Pressure relief valve shall not be covered.
Access panels to thermostat shall be clearly marked

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C. GAS WATER HEATERS: Insulation will be applied to only the sides of the water heater. The overlapped ends of the protective backing should be sealed, and banded in order to provide an adequate seal.

Insulation must not cover any of the following: pilot light, cut-off valve, access panel to thermostat or heating elements, operating instructions, pressure relief valve, drain, any electrical service wiring, hi-limit switch.

D. Insulation will be installed at least three (3) inches off the floor and one (1) inch away from the pressure relief valve.

E. In addition to insulating domestic water heaters, the following measures must be performed:

1. Thermostats will be lowered to a temperature that the client is comfortable with.(120 deg.F is recommended.

2. The first three (3) feet of the hot water line leading out of the domestic water heater will be insulated and **(3) feet of the cold water line to the hot water heater will be insulated** in the same manner and under the same standards as hydronic heating pipes.

Water pipes located in unheated areas may be insulated in the same manner and under the same standards as hydronic heating pipes

3 **The discharge pipe must be properly installed to a minimum of 6" from the floor.**

F. Cabinet type water heaters and water heaters labeled with instructions "Do Not Wrap" should not be insulated.

G. Water heaters located within three (3) feet of furnaces or stoves should not be insulated.

AFTER ALL OF THE ABOVE REQUIRED MEASURES HAVE BEEN COMPLETED, THEN THE FOLLOWING MEASURES MAY BE INSTALLED IN A SINGLE FAMILY DWELLING IF COST EFFECTIVENESS IF VERIFIED BY THE NEAT AUDIT:

A. FURNACE TUNE-UPS

1. Furnace tune-ups and minor repairs may be performed by a qualified individual to increase the efficiency of the heating system.

2. Units must be tested to determine steady-state efficiency prior to performing the work, and after the work is performed to document the results of the work.

B. HEATING SYSTEM REPLACEMENTS FOR EFFICIENCY

A heating system may be replaced for efficiency improvement if the cost-effectiveness can be documented by a NEAT Audit. Replacement units must be properly sized, using a load calculation, and all documentation must be maintained in the client file.

C. WATER FLOW REDUCERS

1. Reducers may include low-flow showerheads, faucet aerators, and toilet-tank flush reducers.

2. Water flow reducers are to be installed only when water is supplied to the house on a metered system or pumped from a well.

3. If the condition of the plumbing is such that damage could result from this installation, this optional measure should be attempted only by someone skilled in plumbing work.

D. FLOOR INSULATION

1. Floor insulation will only be installed under floors separating a heated area from an unheated area.

Floor insulation with an R-value of 19 will be installed unless prohibited by the depth of the floor joist; however, insulation will have an R-value of no less than 11.

2. Insulation will have an attached vapor barrier and will be installed with the vapor barrier towards the heated area.

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3. A three (3) inch clearance from heat producing devices will be maintained.
   Floor insulation will be installed up to and folded onto band joist or joist header.
   Insulation will be fitted tightly around cross bracing and other obstructions between floor joists.

4. All floor insulation will be securely fastened to the floor joists so as to prevent sagging of the insulation. Staples will not be allowed as fasteners for floor insulation. Suggested fasteners are chicken wire or wire staves.

5. Where floor insulation is installed over a crawl space and no foundation wall or underpinning is present, insulation must be protected from vermin, and/or other items that may destroy the insulation. This protection should be done with chicken wire or some other vapor permeable material.

6. Where floor insulation is pre-existing, no insulation will be installed except to replace damaged insulation.

7. Installation of foundation vents is prohibited except to provide for combustion air appliances.

E. SETBACK THERMOSTATS

1. Only solid-state setback thermostats with operating instructions attached will be used.

2. Clients must have the effects and operation of the device explained prior to installation.

3. Install setback thermostats on heating systems only. Do not use the setback thermostat on heat pumps or other combination heating/cooling systems.

4. Install setback thermostats in accordance with manufacturer' s installation instructions.

NOTE: Windows and doors in extreme disrepair are not considered an air leakage measure, but rather an "incidental repair", as defined in the DOE regulations CFR 440.3.

MEASURES SPECIFICALLY PROHIBITED

The following measures are specifically prohibited from installation on single-family housing:

A. Skirting/underpinning of crawl spaces, except that airtight underpinning of a crawl space is allowed for the purpose of establishing the thermal barrier in conjunction with the house "envelope" (e.g. where the crawl space is inaccessible).

B. Storm windows.

C. Foundation vents except to provide combustion air to combustion appliances.

MEASURES NOT SPECIFICALLY PROHIBITED OR CITED

Measures not specifically cited in these Installation Standards are not implicitly allowed; but, rather, the Local Administrator must first receive prior written approval from the DHCD.

INSTALLATION STANDARDS

MANUFACTURED HOMES

ALL OF THE FOLLOWING APPLICABLE MEASURES MUST BE INSTALLED IN ORDER FOR THE JOB TO BE ACCEPTED FOR REIMBURSEMENT.

I. INSPECT HEATING/COOLING EQUIPMENT AND REPAIR AS NECESSARY

II. SEAL MAJOR AIR LEAKS

III. FLOOR INSULATION

IV. INSULATE DOMESTIC WATER HEATER

NOTE: The heating/cooling system safety inspection measures included do not violate State Codes, nor do they require any State license or certification. However, local codes, interpretation of local codes, and enforcement of local codes varies. Consequently, local code enforcement officials should be contacted, and familiarized with the measures to be performed.

If any of these measures appear to violate local codes, or require any licensing or certification locally, DHCD must be notified. DHCD will then communicate with local code enforcement officials and attempt to resolve any problems. If there is no resolution, measures in violation of local codes will not be required to be performed. Building permits should be secured, where required (this is a materials cost).

BLOWER DOOR STANDARDS

Attached to the back of the Installation Standards are procedures and closure targets for using the blower door to address air leakage. A pre-weatherization and a post-weatherization blower door test must be performed on each house. The test readings must be documented on the job report.

Prior approval from DHCD will be necessary for a job to be accepted without a blower door pre-test and post-test for any reason.

Air leakage must be diagnosed by using the blower door, or if the exception applies, then a visual diagnosis must be used. Once the pre-test has been taken, then the closure target must be determined.

THE POST-TEST SHOULD FALL AT OR BELOW THE CLOSURE TARGET. If a submitted job does not meet the closure target, explanation should be provided on the job report, all priority measures must been performed, the job will be accepted, reimbursed, and targeted for monitoring. If the blower door reading falls below the MVR, then a house specific MVR must be done

Measures, which are most apt to affect the blower door reading, are: Sealing Major Air Leaks/Bypasses, and Sidewall Insulation. .

Attachment D

I INSPECT HEATING/COOLING SYSTEM AND REPAIR AS NECESSARY.

ALL HEATING SYSTEM MUS BE UL APPROVED FOR MANUFACTURED HOUSING

REFER TO THE SINGLE FAMILY STANDARDS. THESE SAME STANDARDS APPLY TO MANUFACTURED HOME UNITS.

II. SEAL MAJOR AIR LEAKS

Look for indoor air quality problems (e.g. signs of condensation on the inside of the dwelling), which should be addressed prior to performing air sealing measures. These problems should be addressed at the source of the problem.

Use the blower door to diagnose air leakage

Prevent convective heat losses, which result from large direct openings between the interior and exterior of the manufactured home.

A. Replace missing or broken glass, missing windows, missing doors.

B. Seal all large openings that allow heat loss from the manufactured home (examples: holes in floors, holes in walls, etc.)

C. Seal unused flue openings and fireplaces.

D. Construct a removable door for fireplaces that do not have an operable damper, and are used occasionally.

E. Seal or damper dryer vents, kitchen exhaust fans, window air conditioners, plumbing penetrations, etc.

F. All exhaust fans must be repaired or replaced if not working, if replaced it must be vented to the outdoors.

G. If there is a working re-circulation fan it may be replaced with one that vents to the outdoors.

H. All gas ranges must have an exhaust fan vented to the outdoors.

I. Any kitchen range vents that are repaired or replaced must be vented with rigid pipe.

Attachment D

NOTE: Roof coat will be considered a repair measure.

III. INSULATE FLOOR

A. Prevent conductive heat loss by insulating the cavity between the floor and belly board**. MHEA audit must be used to deviate from this measure.**

Blown fiberglass is required due to the frequency of water leaks in manufactured homes and the damage that can result if cellulose is used.

Client education and added ventilation are encouraged where blower door readings at, or below, the MVR are found or achieved in a manufactured home, particularly if indoor air quality problems exist which cannot be corrected.

1. Missing or deteriorated bellyboard must be replaced/repaired.

2. Where plumbing pipes are located in unheated areas with ducts, provisions must be made to hinder the freezing of plumbing pipes.

3. All accessible areas must be insulated. Only specific areas with less than eighteen (18) inches clearance will be accepted as "inaccessible".

4. Exceptions will not be made for plumbing leaks which occur below the bellyboard.

5. Situations of "health or safety hazard" must be documented and reported. The burden of proof lies with the Local Administrator.

6. Access to the cavity may be gained by drilling a hole in the rim joist or by cutting a hole in the bellyboard and covering it when finished. Special care should be taken when drilling through the rim joist.

B. FIBERGLASS BATT INSULATION

Fiberglass batt insulation is allowable only with prior approval from DHCD. Requirements 1-4 under Section A: Blown Fiberglass Insulation also applies to fiberglass batt insulation.

C. A ground cover with a minimum thickness of 6 mil. will be installed under skirted mobile homes to prevent the diffusion of soil moisture into the building materials.

IV. INSULATE DOMESTIC WATER HEATER

A. Water heaters will be insulated with mineral fiber insulation with a protective backing attached or **bubble wrap** insulation with an R-value of five (5) or better will be used.

Insulation will be applied with the protective backing toward the outside.

B. ELECTRIC WATER HEATERS: Insulation will be applied to the top and sides of the water heater. The Overlapped ends of the protective backing should be sealed, and banded in order to provide an adequate seal.
Pressure relief valve shall not be covered.
Access panels must be clearly marked.

C. GAS WATER HEATERS: Insulation will be applied to only the sides of the water heater. The overlapped ends of the protective backing should be sealed, or banded in order to provide an adequate seal.

Insulation must not cover any of the following: pilot light, cut-off valve, access panel to thermostat or heating elements, operating instructions, pressure relief valve, drain, any electrical service wiring, hi-limit switch.

D. Insulation will be installed at least three (3) inches off the floor and one (1) inch away from the pressure relief valve.

E. Water pipes located below the bellyboard may be insulated in the same manner and under the same standards as hydronic heating pipes.

F. In addition to insulating domestic water heaters, the following measures must be performed:

1. Thermostats will be lowered to a temperature that the client is comfortable with (120 deg. F is recommended)

2. The first three (3) feet of the hot water line leading out of the domestic water heater and **(3) feet of the cold water line coming into the hot water heater** will be insulated in the same manner and under the same standards as hydronic heating pipes.
3. **The discharge pipe must be properly installed outside of the skirting**.

G. Cabinet type water heaters and water heaters labeled with the instructions "Do Not Wrap" should not be insulated.

H. Water heaters located within three (3) feet of furnaces or stoves should not be insulated.

V. Non-Major Air leaks

Install ONLY IF needed for client comfort and still above the MVR.

A. When there is no existing storm window, rework the primary window AND/OR install poly-vinyl magnetic storm windows **or other approved products to obtain good seal**.

B. If the cost to rework a primary window or door exceeds the cost to replace it, then the primary window or door may be replaced.

AFTER ALL OF THE ABOVE REQUIRED MEASURES HAVE BEEN COMPLETED, THEN THE FOLLOWING MEASURES MAY BE INSTALLED IN A MOBILE HOME **WITH APPROVED TRAINING AND WITH PRIOR APPROVAL FROM DHCD USING THE FOLLOWING INSTALLATION STANDARDS:**

A. Ceiling Insulation

B. Sidewall Insulation

MEASURES SPECIFICALLY PROHIBITED ON MANUFACTURED HOMES

The following measures are specifically prohibited from installation on mobile homes.

A. Skirting

B. Foundation vents

MEASURES NOT SPECIFICALLY PROHIBITED OR CITED

Measures not specifically cited in these Installation Standards are not implicitly allowed; but, rather, the Local Administrator must first receive prior written approval from the DHCD.

MULTI-FAMILY DWELLINGS

INSTALLATION STANDARDS

Written approval from DHCD is required PRIOR to using weatherization funds in a multi-family building consisting of more than four units. Local Administrators are encouraged to "pool" resources from other programs so that a more complete job may be achieved. Shelters offering temporary residency may be weatherized but require special reporting. DHCD should be contacted prior to working on a shelter. These installation standards apply only to multi-family buildings, which consist of four or less units.

I. Eligibility

Refer to Exhibit B Of this Agreement and DOE CFR 440.22 (b) in order to determine eligibility, the amount of DOE funds, which can be spent, and reporting requirements.

II. Building "Converted" to Multi-Family

A. Weatherizing the Entire Building

Follow the installation standards for single-family units. Use more than one blower door, if needed, to get enough pressure.

B. Weatherizing an Individual Unit

Set up a blower door in the eligible unit and one in each adjacent unit sharing a common wall with the eligible unit. Record the reading from the eligible unit and refer to blower door targets, MVR, etc.

Standards are the same as for single-family units except: air leakage control should be concentrated in the exterior walls and other openings to unheated areas; only the eligible unit can get floor insulation.

III. "Non-converted" Multi-Family Building (Built as Multi-Family)

A. Weatherizing the Entire Building

If possible, obtain a blower door reading for the entire building. If this is not possible, a reading must be obtained for each unit. Blower doors must be used on units adjacent to the one being tested to account for leakage between the units. Record the reading of the unit being tested, and refer to the standards for closure and MVR.

Standards are the same as for single-family units except air leakage control

should be concentrated to openings in exterior walls, and other openings to unheated areas. Also, exterior doors to common areas such as hallways, stairways, etc. Should be addressed to provide a buffer zone.

B. Weatherizing an Individual Unit

Set up a blower door in the eligible unit and one in each adjacent unit sharing a common wall with the eligible unit. Record the reading from the eligible unit and refer to the closure targets, MVR, etc.

Standards are the same as for single-family units except air leakage control should be concentrated to openings in the exterior walls, and other openings to unheated areas, and floor insulation may be installed only on the eligible unit.

VIRGINIA WEATHERIZATION ASSISTANCE PROGRAM
HEALTH AND SAFETY PROCEDURES

BACKGROUND

The State Energy Efficiency Programs Improvement Act of 1990 (SEEPIA) added health and safety to the statement of purpose of the program. Therefore, the rule now allows DOE Weatherization funds to be used for abating energy-related health and safety hazards. The rule also provides a cost category for accounting for health and safety costs.

RULE REQUIREMENTS

Health and safety is addressed in three places in the rule: A.) Minimum program requirements (Section 440.16); B.) Allowable expenditures (Section 440.18); and C.) Energy Audit procedures (Section 440.21).

VA WAP HEALTH AND SAFETY PROCEDURES

Upon considering the general guidelines in section C.), "Client Health and Safety" and in section D., "Types of Hazards and Preferred DOE Approach" of DRAFT Weatherization Program Notice 93-13, the Virginia WAP will focus its health and safety procedures on hazards related to combustion appliances.

Procedures will include testing carbon monoxide levels in the flue/vent and throughout the living areas of the dwelling, draftability of flues, start-up spillage at flues, adequacy of combustion air, and testing for fuel leaks.

The Installation Standards (1994 State Plan, Appendix A, pp 4-8) require pre- and post-weatherization safety inspections for all combustion appliances.

Removal of mold, odors, viruses, bacteria, unsanitary conditions and rotting wood are conditions frequently encountered by WAP workers. DOE funds will be used to mitigate these conditions in order to allow effective weatherization work and/or assure the immediate or future health of workers and clients.

Abatement materials that are necessary to find or cure these types of health and safety problems may include, but are not limited to:

1. Replacement furnace.

2. Combustion device vent, flue or chimney.

3. A replacement downspout to correct one, which has been, leaking into a basement and causing moisture, mold or wood rotting problems.

4. Replacement of space heater.

5. Water heater replacement

6. Electrical service upgrade or repair.

7. Gas cook stove repair or replacement

8. Exterminators.

9. AC repair or replacement.

Abatement Cost

Cost associated with the abatement of health and safety hazards will be accounted for as a " health and safety cost " in budgets and financial reports, they will not be part of the $2500, as adjusted, average per-dwelling unit cost.

Reference Material Appendix.

Virginia Heating System Manual

NFPA Code 54

NFPA Code 211

NFPA Code 31

Gas Cook Stove Protocol

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